

## REVIEWS

*Tropical Alpine Environments: Plant Form and Function.* Edited by PHILIP W. RUNDDEL, ALAN P. SMITH and F. C. MEINZER. 1994. Cambridge University Press. 376 pages ISBN 0-521-42089-X.

Until recently the alpine vegetation of tropical latitudes has been neglected by tropical ecologists in favor of studies concerning the lowland forests. An approximately decade-long flurry of activity by a relatively small number of scientists has resulted in a wealth of information concerning the structure, function and population dynamics of the plants growing in this marginal environment. Unlike temperate alpine habitats where the landscape is dominated by prostrate cushion plants, much of the tropical alpine environment supports large tussock forming grasses such as *Muhlenbergia* and rosette forming plants like *Espeletia* (Asteraceae), *Puya* (Bromeliaceae) and *Lupinus* (Fabaceae) of the Andes, and *Senecio* (Asteraceae) and *Lobelia* (Campanulaceae) in Africa. This book provides a current overview of research that focuses on; 1) morphological and physiological adaptations to diurnal extremes of temperature, light and water balance along with nutrient limitation and 2) population dynamics and species interactions in a wide variety interesting and unique plants that "experience summer every day and winter every night."

The 20-chapter book begins with an overview of tropical alpine vegetation and climate. These first 2 chapters are excellent overviews that relate the unique features of the tropical alpine to more familiar habitats and are thus essential reading for those not familiar with the high elevation tropics. The next 3 chapters deal with the details of thermal and water balance and cold tolerance focused mostly, but not entirely on rosette forming plants. The chapter on anatomy is focused mostly on xylem anatomy but includes some information on leaves and covers not only rosette plants but sclerophyllous shrubs and cushion plants as well. Several chapters are devoted to single taxa, again the focus is on the common rosette forming plants such as *Puya*, *Espeletia*, *Draba* and *Polylepis*. Of particular interest is a discussion of the physiological ecology of tropical alpine Isoetes, which have no stomates, acquire CO<sub>2</sub> through the roots, and have CAM photosynthesis. Nutrient flow in tropical alpine habitats of Africa are discussed in two very short chapters, one of which shows that adventitious roots of *Senecio* absorb nutrients from still attached leaves that also function as insulation. Pollination ecologists will find the chapter on *Espeletia* reproductive biology interesting since it has unusually high levels of outcrossing when compared with low growing plants in the same habitats. *Espeletia* is typically an entomophilous genus except that the giant rosette forming alpine species are wind pollinated. Chapters 14, 15, and 16 discuss the population dynamics of rosette forming plants of Africa and Hawaiian silversword (*Argyroxiphium sandwicense*). The degree of demographic detail varies substantially for the different taxa but each contains important information. Other chapters pull together information concerning other habitats such as New Guinea and consider the importance and impact of herbivores in the tropical alpine. The book is loaded with ideas and background for further research. In addition, the final chapter written by the editors discusses progress and priorities for future research.

The structure of the book increases its utility to a wide audience. The book is well illustrated both with photographs showing species and habitats and with graphs and tables. The authors are based worldwide so habitats of interest and references to rare literature from around the world are included. Each chapter has a clearly identifiable and informative introduction, several chapters do not contain concluding summaries which would be helpful. References are included with each chapter. The book concludes with a usable index that will be handy for those looking for specific subjects.

*Tropical Alpine Environments* has the usual ups and downs associated with multiple authored volumes, perhaps unusually obvious here because of the vast differences in our depth of knowledge concerning the covered topics. All of the chapters are reasonably well written and each has information valuable to those with a direct interest in tropical alpine research. For those who teach plant structure, function, or population dynamics, this book is a treasure of interesting and thought provoking examples to share with students.

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*Grasses of the Trans-Pecos and Adjacent Areas*. By A. MICHAEL POWELL. Illustrations by PATRICIA R. MANNING. 1994. The University of Texas Press, Austin. xiv + 377 pp. Hardcover \$75.00. ISBN 0-292-76553-3. Paperback \$29.95. ISBN 0-292-765568-8.

Perhaps only in a state as expansive and biologically diverse as Texas is it worthwhile to publish a guide to grasses representing a portion the state. But as Texans can rightly boast, their biodiversity is vast, like the state itself. In *Grasses of the Trans-Pecos and Adjacent Areas* Dr. Powell has provided an attractive and well-written summary of the grasses of the expansive Trans-Pecos region, which will also be useful in southeastern New Mexico and the northern part of Chihuahua, Mexico.

The book treats 268 species and 24 varieties, representing 83 genera, which includes 53 endemic and 83% native taxa. About half of the species known from Texas are excluded (Gould 1975), which will expedite identifications for those working in the Trans-Pecos. The keys to tribes follow Clayton and Renvoize (1986), whereas the arrangement (order of presentation) generally follows Gould (1975). The hardback edition is an ideal size, about 6 by 9 inches, which readily fits into backpacks and attaches. The pages are neither overly cluttered nor have excessive amounts of unused space.

Beyond the *Preface* and *Acknowledgements*, the book has eleven sections. The *Introduction* is a brief overview of the region, including major landforms and climate. Figure 1 illustrates the major physiographic details of the Trans-Pecos, such as counties, mountain ranges, and major municipalities. *Grasses in Perspective* is the most cursory treatment, but will be of interest to non-specialists. *Grasslands* has a valuable discussion of the vegetation of the region, which includes 15 black and white photos. This overview will be particularly useful to those visiting the area for the first time, especially as it covers grasses and non-grasses in the descriptions. Powell has a solid command of regional history, and with more detail than many local treatments discusses how human activity has altered landforms and vegetation types; to my mind this adds significantly to the text. *Morphology of Grasses* presents the additional technical terminology needed to identify grasses. Admirable here is Powell's specific mention of local species to represent various morphological features, and his discussion of the peculiarities of the Paniceae and Andropogoneae, which will almost always confuse those who have not had specific training in agrostology. *Grasses of Trans-Pecos Texas* is a one-page numerical summary of Trans-Pecos grasses, mostly with respect to the grass flora of Texas overall. *Subfamilies, Tribes, and Genera Represented in Trans-Pecos Texas* enumerates the genera (including species number) by subfamily and tribe. Perhaps such information could have been summarized more cryptically but effectively as in Mabberley (1987). The *Key to the Tribes* should not be problematic for those with much experience in grasses. The next 300 pages is *Descriptive Grass Flora*, which provides descriptions of tribes and genera, and keys to species. Species descriptions are lacking, but the keys to species seem to present sufficient information to make identifications with reasonable certainty. Synonymy is excluded except when recent name changes have been invoked, or when there has